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Fishing Life in the Bangweulu Swamps (2): An Analysis of Catch and Seasonal Emigration of the Fishermen in Zambia.

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ABSTRACT The aim of this paper is to describe and characterize the swamp fishing in the Bangweulu Swamps, Zambia. The fish catch by the several fishing methods are analysed after these methods are outlined. As a result of the analysis, it is indicated that each production unit chooses a fishing method to catch a particular group of fish, such as Mormyridae or Cichlidae fish.

The types of fishing activity among the fishermen are divided into three classes in terms of their fishing seasons and methods. These types of fishing differ from each other as to how far their villages are from the swamps and what time schedules of agriculture are made according to the limits of the season or the period of fishing in the swamps. By analysing these types alloted to different ethnic groups, it is clarified how the swamp area is actually utilized by the several ethnic groups from different areas.

Most of the fishermen in the Bangweulu Swamps are the part-time fishermen who are also engaged in cultivation to a considerable extent. It is discussed why these essentially agriculturalists carry on fishing for themselves without making symbiotic relationships with other fishing specialists. They can get a good cash income by selling the catch, and this urges them on with fishing. The fish meat is also appealing to them, for they do not have many domestic animals, nor can so many animals be hunted around their home villages. Thus, it is concluded that both of the subsistence activities, cultivation and fishing, are essential to the life of the swamp fishermen in the Bangweulu Swamps.

INTRODUCTION

In recent years, several monographs of ecological anthropology which preserve a subject of human evolution have been attempted in the African Continent. The subsistence ecology among the gatherer-hunters, such as the San in the central Kalahari (Tanaka, 1971, 1980), the Mbuti Pygmy in Ituri Forest, Zaire (Harako, 1976, Tanno, 1976, Ichikawa, 1982), the woodland cultivators, Tongwe on the eastern shore of Lake Tanganyika (Kakeya, 1974) and the camel pastoralist Rendille, in northern Kenya (Sato, 1980) have been studied. Also the fishermen's societies have been studied at the shore of Lake Tanganyika and Zaire River (Hata, 1968, Ankei, 1982). However, a study of the activities of fishing among the swamp fishermen has never been attempted.

In this paper, the author aims to describe and characterize the swamp fishing in the Bangweulu Swamps, Zambia, and contrast it with other human activities for livelihood such as hunting, gathering, pastoralism and agriculture. Although the Republic of Zambia is a landlocked contry, it is well provided with large rivers

and lakes, such as the Chambeshi River, the Zambezi River, Lake Tanganyika and Lake Bangweulu which have a large number of fish. Fishes provided from the inland waters occupy an important part as animal food for the people, and inland water fishing has been carried on for a long time, and provided the people with natural food resources in this country.

According to Fisheries Statistics (1977, p. 15), catches recorded in Bangweulu Area in 1971 account for 24.4% of the total amount of catch in Zambia. Most of them were taken from the swamps. The fish catch in other fisheries in Zambia include the catch by swamp fishing, which is nearly 50% of the total catch by estimate. Despite the fact that swamp fishing in this country occupies such an important part of the people's diet, studies about it have been insufficient except for those studies which are indicated below. In countries other than Zambia, no studies about swamp fishing have ever been carried out.

The first study of the fishing in the Bangweulu Swamps was done by W. V. Brelsford. He opened up the channels in the swamps (Brelsford, 1944) as the District Commisioner at Luwingu District, the former Northern Rhodesia, and he gathered the materials and published a monograph (1946) about the fishermen in the swamps. He got a good picture of swamp life and described the fishing activities of the Unga people who have their home villages on the islands in the swamp area. He insists that annual rizes and falls of the water level in the swamps have some influence on the life cycle of the people. He regards the swamp area as the feeding grounds of fish rather than the breeding grounds, paying attention to the natural environment of the swamps and breeding habits of the fishes. He also points out that the Unga people choose rather to go fishing in the swamps than to go to work to the cities or mines in the Copperbelt Province because of the ability to earn good money without leaving home or breaking up family and clan unity.

D. W. Evans was a research officer at Bangweulu Research Unit of the Department of Fisheries on the western shore of Lake Bangweulu. He carried out his basic research about the ichthyomass of the lake in order to grasp the fisheries resources (Evans, 1983).

M. Ichikawa and the author have continued their field research of ecological anthropology about swamp fishing which they had begun in 1983 in order to extend their field to the swamps which have their own peculiar qualities in the woodland savanna in the African Continent. Before their field research, M. Kakeya and M. Ichikawa (1983) did the preliminary survey in Zambia. Ichikawa (1985) divided the fishing strategies adopted by each fishing unit in the swamps into two distinct types by analysing the fish catch done by six different fishing methods. The former is called a specialist strategy in which the fishing effort is focused on one fishing method, and the latter is called a generalist strategy in which effort is dispersed to include various methods. He concluded that there will be no significant difference in the long run in the efficiencies among the different fishing units as well as among the different fishing methods.

The author (Imai, 1985) describes the fishing life in the Bangweulu Swamps generally, and points out the production unit of fishing that is called *nsanga*. *Nsanga* contains an owner, his work-mates and his fishing gear, and they share the money obtained from selling the catch with them. He regards the difference of fishing season or method among the fishermen who come from several ethnic groups, as a segregation among the swamp fishermen. He also points out the necessity of doing

a field research in their home villages in order to understand the whole life of the fishermen including their other subsistence activities (Imai, ibid., p. 55).

Having done the first research in 1983, the author carried out his second research from August 1985 to January 1986, during which he stayed in a home village of the Unga fishermen at Kasoma island in the swamps and also in a fishing camp which was settled by the people of the village. He could observe the other subsistence activities of the people such as cultivation around the village, and got some data through the second research. It is clarified that the swamp fishermen devote their energies not only to fishing but also to cultivation for making their living.

This paper first describes the organization of fishing that is unfolded in the fishing camps. Secondly, it analyses the contents of the catch by the different commercial fishing methods and compares them with each other. It also analyses the mutual utilization of the swamps among the fishermen, and discusses the factors that are derived from it. In the last part of this paper, there is a discussion on why the fishermen carry on fishing for themselves without making symbiotic relationships with other fishing specialists.

RESEARCH AREA AND FISHERMEN

Lake Bangweulu has an area of about 2,700 km^2, and is located in Luapula Province in Zambia (Fig. 1, 2). Samfya, on the western shore of the lake, is the

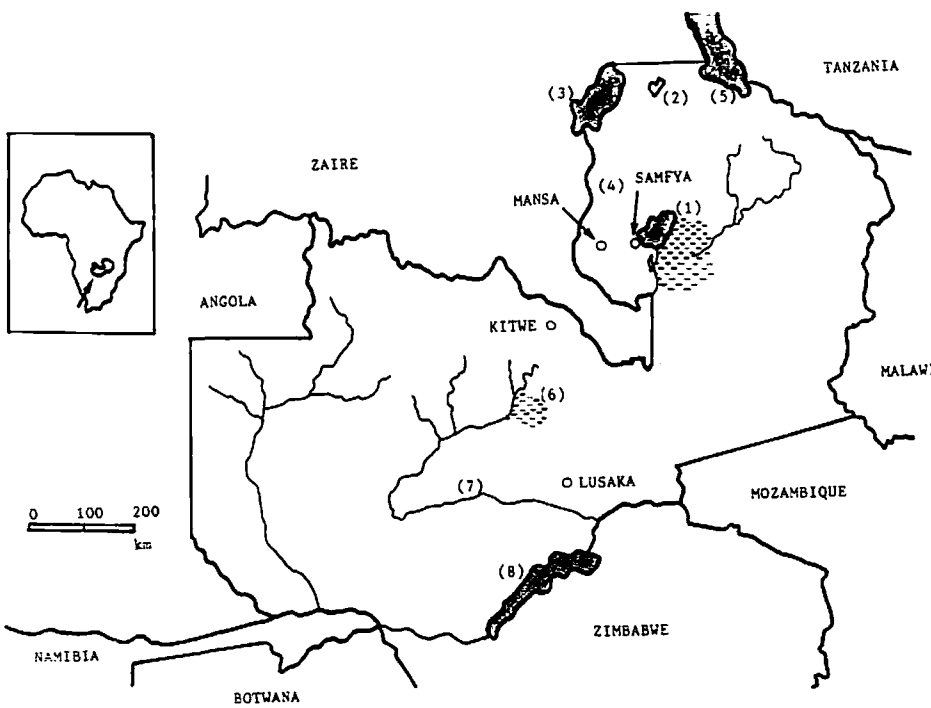


Fig.1. Map of Zambia.

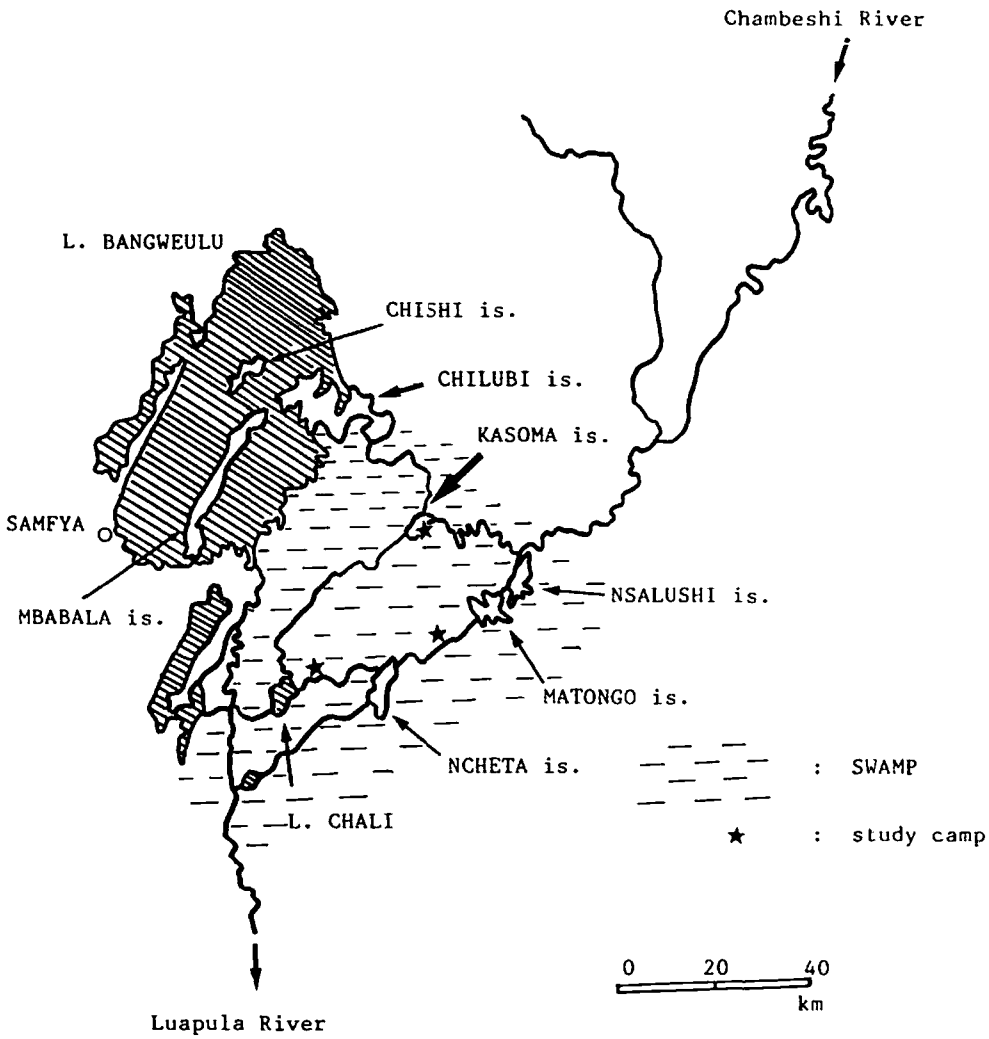
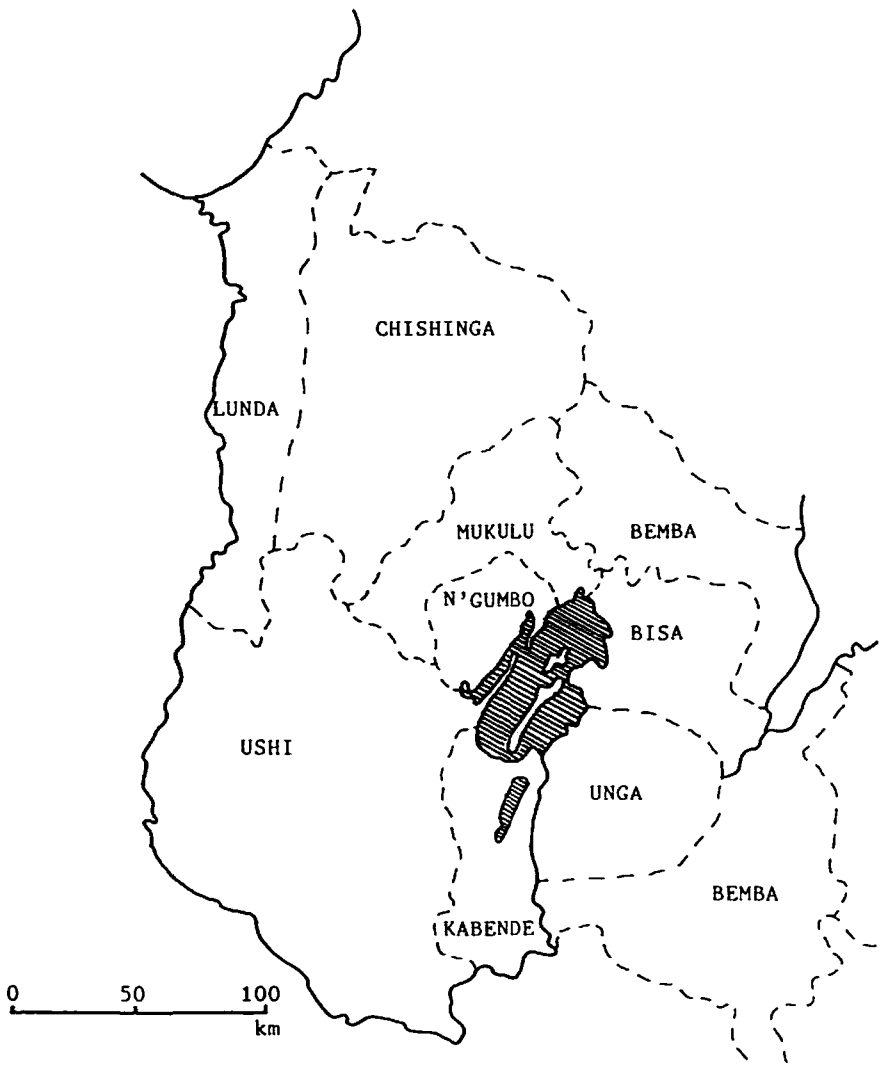


Fig.2. Map of Bangweulu Fishery.

biggest town and the executive centre of Samfya District. The great swamp which stretches widely to the south and south-east of the lake is more than 5,000 km^2 in extent at the end of the rainy season.

People living on the lake or swamp islands, such as Mbabala, Kasoma, Ncheta and those living on the mainland around the lake enter into the swamps for fishing in the dry season (from April to November). The water level of the swamps falls down gradually in this season. They put up their sheds on the floating islands which are made up of reeds and papyrus or on the banks of the channel to form a fishing camp and perform their seasonal fishing. Some of them dry their catch in the sun, and others smoke them. They sell them to the traders who come into their fishing camp. Swamp fishing has become more than a subsistence activity with the development of the fish market since the colonial days. According to Brelsford (1946, p. 79), the commercial route of fish to the Copperbelt markets

was established by 1924. There are some ethnographies in existence about the people living around Luapula River and Lake Bangweulu (Brelsford, ibid., Cunnison, 1959). Fishermen of the Bangweulu Swamps come from the mainland villages around the lake or dotted islands in the lake or swamps, such as the N'gumbo, the Mukulu, the Kabende, the Bisa and the Unga, all of whom are the Bemba speaking people (Fig. 3). Brelsford (ibid., pp. 11–15) states that their arrival in this area is associated with that of the larger group of Bemba people who made the migration from Angola in eighteenth Century. However, P. B. Mushindo insists in his book "A short history of the Bemba" (1977) that the Bemba were proceded by



(G.Kay, 1962)

Fig.3. Geographical distribution of the ethnic groups around Lake Bangweulu.

other people which are known as the Bisa, the Mukulu, the N'gumbo and so on. Anyway, they are similar to the Bemba people culturally. According to the census carried out by the Administration in 1969 (Central Statistical Office, 1974), the total population of the N'gumbo is about 40,000, the Kabende 35,000 and the Unga 16,000.

As described in the previous paper (ibid., pp. 51–52), it is said that the people called Batwa, who are taken for the aboriginal inhabitants of a Bushman or Pygmy type, make their living mainly on fishing in the swamp area. However, the author could not confirm the existence of the Pygmy type people in the swamps through his two times of field research.

NATURAL ENVIRONMENT

1. Topography, Climate

The Bangweulu Swamps is at an altitude of about 1,100m, and it is up to 4–5 metre in depth (Tait, 1965, p. 69). The swamp is dotted with small and flat islands. Several rivers flow into the swamp area besides the Chambeshi River. That is the uppermost course of the Zaire River from the north-eastern side, and outlet river Luapula flows out from the south-western corner to Lake Mweru. As for other characteristics of the water system, there are canals and channels dug, which tie the dotted lagoons to each other and facilitate communication among the people.

E. W. Evans (1983, p. 25) states that there are three distinct seasons which affect the area, as follows:

1. cool dry season (May to early August)
2. warm dry season (August to October)
3. warm rainy season (November to April)

In the dry season, the mean monthly temperature is around 16–17°C during May through July, and it gradually rises through September to reach a maximum of 23–24°C in October. The rains begin in early November and continue until late April with temperatures gradually falling to around a mean of 21°C. The annual rainfall for six months is in the range of 1,300–1,400 mm (Meteorological Department, 1971).

After the rainy season, the rivers pour into the swamps, so that April and May are months of the highest water level in the swamps. In July and August, there is a gradual fall which is accelerated during the period of the lowest water level. Therefore the fishermen can fish actively in the swamps only during the period from the middle of April to the middle of December. Fig. 4 indicates the rainfall and water level of the lake recorded at Samfya from July, 1982 to June, 1983. As indicated in the figure, lake water levels are their lowest shortly after the start of the rains in November. High water level is reached at the end of the rains in March or April. The water level variation reaches nearly 50 inchs (about 125 cm).

2. Vegetation and Fauna

Around the study area, it is overgrown with papyrus (*Cyperus papyrus*) and reeds (*Phragmites mauritianus*), but there are no trees except a small number of trees which are planted in the islands. Waterlilies and weeds such as *Nymphaea capensis*

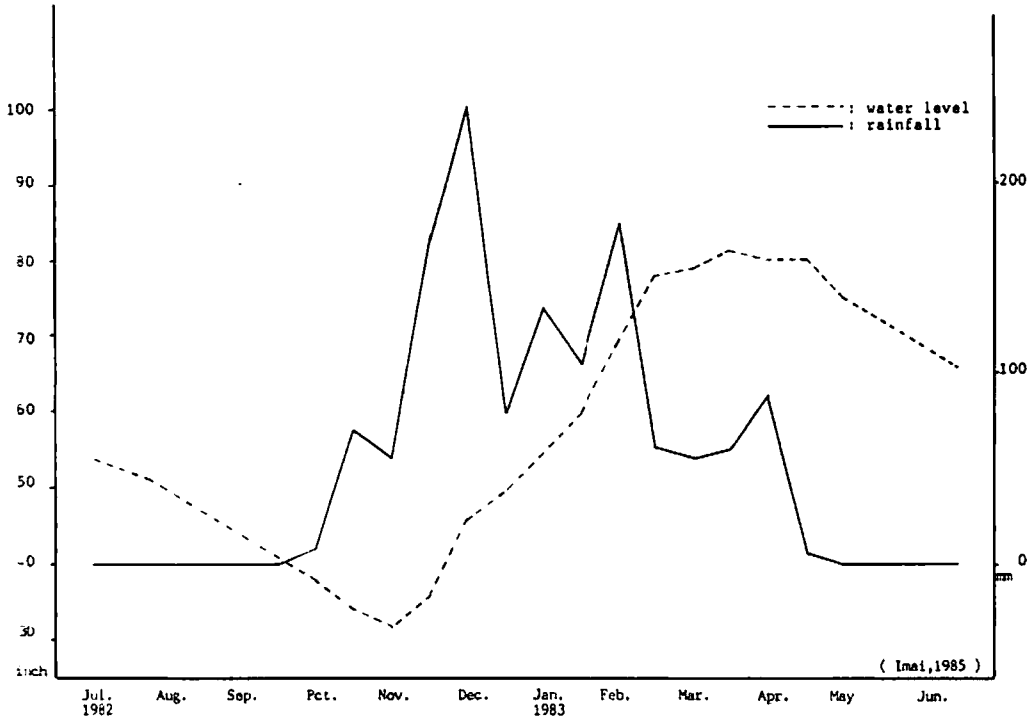


Fig.4. Water level and rainfall at Samfya (Imai,1985).

and *Eleocharis dulcis* can be found in channels and lagoons. The author confirmed that the people collected and utilized the five kinds of plants as indicated below. People took them as leaf relishes.

Commelina buchanani	(*icigogo*)
Amaranthus dubius	(*ibondwe*)
Ipomoea rubens	(*mulyamfubu*)
Alteenanthera nodiflora	(*ntenda*)
Ocimum americana	(*lowena*)

86 species of fish are recorded from the Bangweulu region, and of these species, 33 are of commercial importance (Tait, ibid., p. 69). During the research period, fishermen of the study camp caught 33 fish species indicated in Tab. 1, and they consumed all the species which were caught. Fish identification was done by Ichikawa and the author with reference to the check list by P. B. N. Jackson (1961), and with the help of the Department of Fisheries at Samfya. Fishes are either confined or spread out seasonally according to the rise and fall of water. Some of the fish breed at the end of the year before the dispersal (Tait, ibid., p. 70).

As to the mammals, except for elephants and lechwes entering into the marsh around the swamps in the dry season, hippopotamis live in the water, but they have little effect on the life of the fishermen, for the fishermen rarely hunt animals in the swamps. However, it sometimes happens that a canoe of fishermen is tipped over by a hippopotamus, and a kind of otter or wild duck frequently cause damage to the catch by stationary gill net fishing. Some fishermen set snares called *ubukusa*

Table 1. Fish species recorded in the research area.

Species	vernacular name
MORMYRIDAE	
Mormyrus longilostris Boulenger	*mbubu*
Mormyrops deliciosus (Leach)	*lombo*
Marcusenius monteirii (Gunther)	*ncesu*
M. macrolepidotus (Peters)	*mintesa*
Petrocephalus simus Sauvage	*cise*
P. catostoma (Peters)	*cipumamabwe*
CHARACIDAE	
Hydrocyon vittatus Castelnau	*nsanga*
Alestes grandisquamis Boulenger	*matula*
A. macropthalmus Gunther	*manse*
A. imberi Peters	*lusaku*
CITHARINIDAE	
Distichodus maculatus Boulenger	*lubala*
CYPRINIDAE	
Barbus banguelensis Boulenger	*mumbulwe*
Labeo altivelis Peters	*mpumbu*
SCHILBERIDAE	
Schilbe mystus (Linneaus)	*lupata*
CLARIDAE	
Clarias gariepinus Peters	*umuta*
C. ngamensis Castelnau	*umuta*
C. obscurus Poll	*icimpule*
C. theodorae Weber	*mulonfi*
C. buthpogon Sauvage	*bomba*
Heterobranchus longifilis Valanciennes	*sampa*
MOCHOKIDAE	
Synodontis ornatipinnis Boulenger	*bongwe*
S. nigromaculatus Boulenger	*cinnymba*
BARGIDAE	
Chrysichthys mabusi Boulenger	*kabonbola*
Auchenoglanis occidentalis C. & V.	*mbowa*
CICHLIDAE	
Sarotherodon macrochir Boulenger	*nkamba*
Tilapia rendalli Domeril	*mpende*
T. sparmanii Smith	*matuku*
Serranochromis angusticeps (Boulenger)	*polwe*
S. robustus (Gunther)	*nsuku*
S. thumbergi (Castelnau)	*ntasa*
Haplochromis mellandi(Boulenger)	*mbilia*
Tylochromis bangwelensis Regan	*nsangula*
ANABANTIDAE	
Ctenopoma multispinis Peters	*nkomo*

around the fishing camp in order to catch various kinds of birds such as wild duck, geese, herons, etc. The snares are usually made of nylon or cotton line which is used for mending nets. As they set a small number of snares, they cannot get much catch. It can be said that they do not hunt actively.

FISHING CAMP AND PRODUCTION UNIT

As stated in the introductary chapter, most of the fishermen in this area do not fish all the year round. From January to March, most camping sites are flooded frequently because of the rains, so only some types of fishing are possible in this period. They cultivate cassava, maize or finger millet around their home villages, and they are dependent on the yield of agriculture. As the basis of their subsistence is agriculture rather than fishing, the period of fishing is dominated by schedules of their cultivation and the water level in the swamps. The actual time schedule for both activities are analysed later. The author already described the materials and structure of the fishing hut, and the canoes used in the swamp area in the previous paper (1985, pp. 55–57). In this chapter, he draws his attention to the fishing life, describing and analysing the fishing unit among the fishermen in detail. In the next chapter, he describes several methods of commercial fishing and analyses the catch made by them.

1. Fishing Camp

Fishermen call their fishing camp *pamitanda* or *mitanda*. Kakeya and Sugiyama (Kakeya & Sugiyama, 1985, p. 12) state that the Bemba people near Mpika put up their sheds for slash-and-burn agriculture called *mitanda* in the process of *Citemene* system for finger millet cultivation.

In the swamps, fishermen have not much land where they can put up their sheds for a fishing base even in the dry season when the water level decreases. The fishing grounds have always been regarded as open to anyone as Brelsford (1946, p. 74) stated, so that the fishermen can go fishing anywhere in the swamps. Each fishermen chooses a camping site where the room for his shed remains, and he performs his fishing there. Sometimes it happens that he puts up his shed on a floating island.

Although chieftainship has little influence and fixed membership based on the same ethnic group does not exist in a fishing camp, the people who have kinship relationships to one another living in the same or neighbouring villages are apt to concentrate in a particular camp. As shown in Tab. 2a, b, the study camp in 1983 has been utilized by the fishermen of the N'gumbo, the Unga and the Kabende, and that of 1985 has been utilized by those of the Bisa, the Unga and the Kabende. Some fishermen of the same group have kinship relationships to one another as shown in Fig. 5. Many of them told the author that they have utilized the same camp every season. Affinal relationships crossing the groups can be found frequently, and they are apt to organize the production unit of fishing, which will be described below.

As described in the previous paper (ibid., p. 56), every fishing camp is registered to a chief of the area, and fishermen must have a fishing licence from the Administration. Besides this, there is a custom to pay tribute (fish or cash) to the chief of the area. Sometimes a man from a chieftainship goes around the fishing

Table 2a. Fishing Unit and period in the Study camp (1983)

Unit	Persons	Method	1983 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	1984 1. 2.
N'gumbo				
1. Mwa.	3	B3		
2. Rob.	1	B3		
3. Abi.	2	B3		
4. Eli.	2	B3		
5. Emm.	1	B3		
6. Seb.	1	B3		
7. Nel.	1	B3		
8. Mpu.	3	B3		
9. Bej.	3	B3		
10. Cha.	1	B3		
11. Bet.	3	B3		
12. Dom.	2	B3		
13. Mus.	1	B3		
14. Fel.	1	B3		
Unga				
1. Bai.	3	B3		
2. Obi.	5	B1a, b		
3. Sam.	5	B1b, 2		
4. P.K.	1	B1a, 3		
5. Yob.	2	B1a, b		
6. Kal.	2	B1a, b		
7. F.P.	2	B1a, b		
8. Lev.	4	B1a, b		
9. Alf.	3	B1a, b		
10. Mwe.	3	B1a		
11. Cho.	1	B1a		
Kabende				
1. Tal.	3	B1a, b		
2. Fra.	2	B1a, b		
3. Hab.	1	B1a		
4. Sec.	2	B1a		

B1a: *Malalikishya*, B1b: *Ukusebeshya*, B2: *Mukwao*, B3: *Mukombo*, A5: *Ubwamba*, – : fishing period.

camps to levy tribute, but it is not levied strictly.

Although the fishing camps are not organizationally connected to one another, fishermen take a holiday every Sunday, and have a chance to visit other camps to have some alcholic drinks (*ombwa*, *mandalakwa*), which are made from maize powder, finger millet, or manufactured sugar. So we see that fishermen in a fishing camp are not regarded as a functional group which accomplish certain purposes. However, it can be said that everyone is included in fishing as a member of the

Table 2b. Fishing Unit and period in the Study camp (1985)

Unit	Persons	Method	1985 3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	1986 1.	2.
Kabende														
1. Mil.	3	B1a, A5				—	—	—	—	—	—	—		
2. Ben.	2	B1a, A5				—	—	—	—	—	—	—		
3. Ste.	2	B1a, A5				—	—	—	—	—	—	—		
4. Yon.	2	B1a								—	—	—		
5. J.M.	2	B3					—	—	—	—				
6. Kun.	2	B3				—	—	—	—	—				
Bisa														
1. Sac.	2	B3		—	—	—	—	—	—	—	—			
2. Mus.	2	B3		—	—	—	—	—	—	—	—			
3. M.C.	2	B1a, b		—	—	—				—	—	—		
Unga														
1. Tan.	1	B1a			—	—				—	—	—		
2. Kat.	3	B1a				—	—	—			—	—		
3. Kas.	5	B1a						—	—	—	—			

B1a: *Malalikishya*, B1b: *Ukusebeshya*, B3: *Mukombo*, A5: *Ubwamba*, — : fishing period.

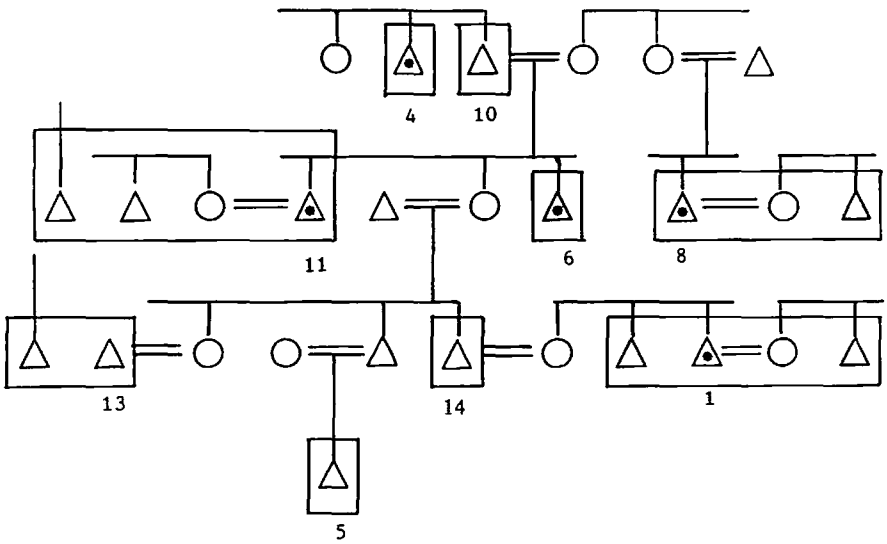
production unit of fishing as described below.

2. Production Unit

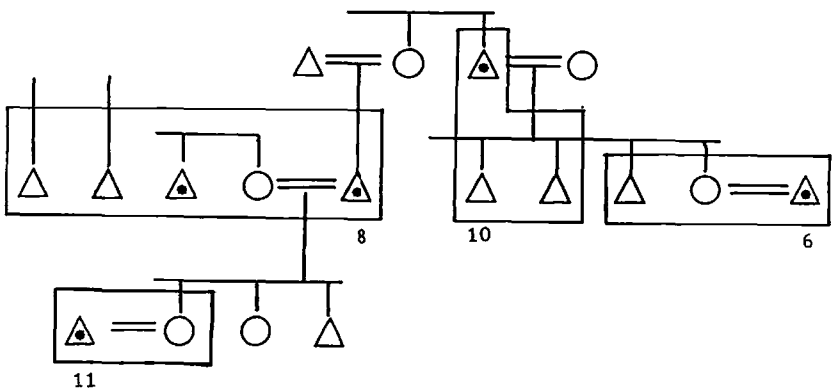
Swamp fishermen organize a fishing unit in which they fish together, the interest of which is to distribute the profit of the fishing among its members. People call it *nsanga*. Tait (1965, p. 70) only states that frequently one fishermen employs several helpers. This type of production unit of fishing cannot be found in earlier reports about fishing except by Ichikawa (1985, p. 31) and the author (ibid., p. 57). In the area they studied, all the fishing activities for selling the catch are performed by independent production units. Even a solitary fisherman in a camp is recognized as the master of a production unit (*nsanga*) among the fishermen. For he can sell his catch to get profits independently. Each production unit adopts a particular fishing method as their commercial fishing method, and sell their catch to the traders. Sometimes a representative of a unit goes to the towns at Copperbelt Province for selling their catch.

One *nsanga* is composed of a representative fisherman (*umushila*), his one or several co-workers (si. *umuswa*, pl. *abaswa*) and their wives and children. In Bemba language, *umushila* means an independent fisherman who possesses his own fishing gear (canoe, fishing net, etc.) and can fish by himself in the swamps. That is to say that *umushila* possesses both capital and techniques for fishing in the swamps. An informant of the Unga said that a master of the unit is called *umukolombeshi* among the Unga people, and all of his fishing gears (canoe, fishing net, firewood, etc.) are called *nsanga*. *Umushila* also possesses a wire net for smoking fish in case *nsanga* processes the fish in order to sell them. Conversely, *umuswa* (or *abaswa*) does not possess fishing gear of his own and he must depend upon *umushila*'s *nsanga* (gear).

a. the N'gumbo fishermen



b. the Unga fishermen



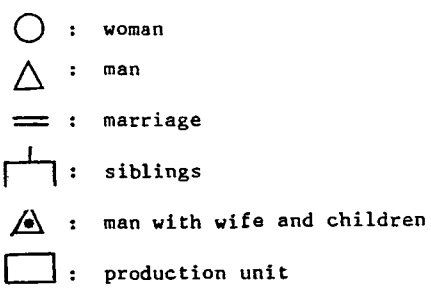


Fig.5. Genealogies of the fishermen in the study camp (1983).

Umushila has to prepare the materials for the making of the huts in the camp, the amount of which is fixed according to the number of *abaswa* and their families, and they put up their sheds together at the camp and work together for selling their catch. This union composed of *umushila* and *umuswa* or *abaswa* can be regarded as a production unit, which is recognized by fishermen themselves and it is named *nsanga* which originally means the capital of *umushila*. Several informants told the author that it should be called "company" because of its character for selling fish.

The relationships of a particular *umushila* and *umuswa* in a *nsanga* do not last for more than one fishing season. A N'gumbo informant said that a N'gumbo man who keeps his fishing gear and can provide foods and wood, calls for his new *umuswa* or *abaswa* of the next season in February or March to be *umushila*. Several men apply and converse with him. After they agree in some respects to the fishing grounds, periods and the share of the profits, they become members of the same production unit.

Tab. 3 shows the number of the relationships between *umushila* and an *umuswa* of the 41 production units which were confirmed in the study camp of 1983 and 1985 (Tab. 2a, b). In many cases, a *nsanga* is composed of brothers-in-law (*mulamo*) rather than friends of the same village, father-son or brothers in a nuclear family. A man and his nephew, his sister's husband, his wife's brother or her sister's husband are apt to form a *nsanga*.

Table 3. Number of the Relationships between an *umushila* and *umuswa* in the production units (*nsanga*).

Ethnic group	Solitary or with his wife, children	Father-son-	Brothers	Brothers-in-law	Uncle-nephew	Others	Total
N'gumbo	7	3	1	4	2	0	17
Unga	3	5	0	6	3	0	17
Bisa	3	0	0	0	0	0	3
Kabende	3	1	0	5	0	0	9
Total (%)	16 (34.8)	9	1	15 (32.6)	5	0	46

The share of profits is not fixed among the members of a unit. It differs a little from unit to unit. Generally speaking, *umushila* can get more than other members, for he must supply other members with fishing gears, foods and fuel. That of an unskilled *umuswa* is lower. The author was told that in the case of a unit with five *umuswa*, in the study camp, *umushila* gets 30% of the profits and the rest of it is shared equally among the *abaswa*. If a unit gets much more profit than that of their prediction, the *abaswa* complain about the decided share and the negotiation with *umushila* is held over again in the camp. When a new decision by mutual agreement cannot be attained, the reaction of *umuswa* differs between the Unga and the N'gumbo. A discontented fisherman of the Unga is apt to secede from the

unit and returns to his village. Unga fishermen usually share profits every time they sell to traders. On the other hand, N'gumbo *umuswa* receives his share at once in his home village after the fishing period.

As described above, *nsanga* means a production unit of fishing which is formed on the assumption that the fishermen get profits by selling their catch. It can be supposed that this type of production unit began to be organized when this area was incorporated into commercial cycle of fishing in the Copperbelt area markets. However, the author would like to point out that a production unit (*nsanga*) is not only composed of people who are linked together economically, but also connected by blood ties or affinity. It must be added that there are many fishermen staying with their wives and children as indicated in Fig. 5. Although few of them act to fish in the swamps, they are thought to stay in the swamps as a matter of course. More than half of the N'gumbo fishermen stay in the camp with their family, and that is applicable also to the Unga fishermen whether he is a *umushila* or a *umuswa*.

FISHING METHOD AND CATCH

Mortimer (1965, p. 33) states that methods of inland water fishing in use in Zambia can be divided into two main groups:

Group A. Small-scale fishing Methods

Group B. Commercial fishing Methods

Small-scale fishing Methods that have been in use for many years are for a fishermen's self consumption. Commercial fishing is the means for financial profit, and its methods of fishing usually make use of nets. In the previous paper (1985, pp. 60–72), the author adjusts the fishing methods in use in the Bangweulu Swamps according to Mortimer (ibid.), and gives a general description of them. In this chapter, the catch by five fishing methods are analysed and characterized, for more data could be collected through the second research in 1985 to add to the former data collected in 1983. Tab. 4 indicates a list of the fishing methods in the swamp fishing. Before making analysis of the catch by these methods, we must refer to the fishing net briefly.

According to Evans (1983, p. 22), nylon gill nets were first introduced in the early 1940's; but were not in common usage until 1950. The greater part of the nets are made in Taiwan and China, rather than in Zambia. Stretched net length is 50 yards (about 45m) each, depth of it is 26 meshes. There are several kinds of mesh size of net more than 1 cm. Fishermen can purchase them in the villages or from peddlers who come to fishing camps. Fishermen who perform stationary gill net fishing usually put floats and sinkers on the nets, and let their net grow to 100 yards by means of tying two nets. However, the total length of the net become shorter less than 100 yards as the length of time in use increases, for fishermen must cut off the teared parts and mend their nets frequently. Nine gill nets owned by the fishermen were measured at the study camp in 1983 (Tab. 5). The set length of each net was limited to 50–70 m, and the average length was about 62 metres. Generally speaking, the longer the period of time used, the shorter the length of the net becomes.

As shown in Tab. 4, commercial fishing methods are divided as follows:

B1. stationary gill net

Table 4. Fishing Method.

A.	Small scale fishing method			
1.	a. *ndobani*	handline		
	b. *umulindi*	rod and hook		
2.	a. *mwando*	longline	(shallow area)	
	b. *akabamba*		(lakes)	
	c. *ubunyimba*		(bottom set)	
3.	*semu*	lures		
4.	*ukusaya*	driving small fish		
5.	*ubwamba*	weir		
6.	*imiela*	spearing		
7.	*ububa*	fish poison		
B.	Commercial fishing method			
1.	a. *malalikishya*	stationary gill net		(one night)
	b. *ukusebeshya*			(several hours at night)
	c. *mutobi*			(several nights)
	d. *mapila*			(several hours in the daytime)
2.	a. *mukwao*	seine net	(in swamps)	
	b. *kapopela*		(in lakes)	
3.	*mukombo*	driving fish		
4.	*ukukunguluka*	drifting net		

Table 5. Length of Gill Net used.

nsanga	Mesh size (ins.)	Total length (m)	Use
Obi.	1.75	50.2	*malalikishya* or *ukusebeshya*
	1.75	55.8	
	1.5	67.6	
	1.5	58.0	
	1.5	62.7	
	1.5	71.3	
	1.5	69.5	
Cha.	4.0	75.4	*mutobi*
Sam.	1.5	55.8	*mukwao*

B2. seine net
B3. driving fish
B1a. stationary gill net (one night)—*malalikishya*—

Fishermen set the nets with floats and sinkers in the evening (4:00–5:00 P.M.), and collect the catch the next morning. *Malalikishya* fishing is used popularly as a method for commercial fishing in the early and later period of the rainy season (December–January, April–May). In these periods, the water level increases gradually on account of the frequent occurence of rain, which prevents fishermen from using any types of commercial fishing in the fishing ground other than this method. Fishermen may use this method in other periods, but most of them set their nets irregularly and reduce the number of nets set, so that the catch by this method occupies no more than that used for self-consumption for each unit.

As indicated in the previous paper (ibid., p. 63), the author would like to point out the differences of the fish caught according to mesh size of the net. Tab. 6 shows the species composition by the *malalikishya* method. When the fishermen use a net of 1.5 ins. (about 3.8 cm) stretched mesh size, the majority of the catch is composed of two species as follows: *Tilapia sparmanii* (*matuku*) and *Marcusenius macrolepidotus* (*mintesa*). Conversely, when nets of more than 1.5 ins. mesh size are used, the rate of *mintesa* fish decreases, and the other Cichlidae fishes other than *matuku* increase.

As Ichikawa (1985, pp. 34–35) adopts, the index of species diversity which is used here expresses the diversity of fish species caught by the different methods. This was divised by Simpson (1949) for expressing the species diversity of a plant community, and is calculated from the following formula.

$$\text{Index of Diversity} = \frac{1}{\sum_{i=1}^{n} (pi)^2}$$

where *pi* indicates the proportion of i species to the total catch, and n the number of species caught by each method. The smaller the index, the more selective a fishing method is to the ichthyofauna.

According to Tab. 6, the index of catch by a net of more than 1.5 ins. mesh size reaches more than twice that caught by a net of 1.5 ins. mesh size. *Malalikishya* fishermen who carry on small scale fishing use the net of more than 1.5 ins. mesh size. However, most of the fishermen who use this method in order to catch Mormyridae fish in December to January adopt the nets of 1.5 ins. mesh size as stated in the previous paper (ibid., p. 63).

B1b. stationary gill net (several hours)—*ukusebeshya*—

The type of net used in *ukusebeshya* fishing is the same as the net of *malalikishya*, but the net of 1.5 ins. mesh size is used exclusively. *Ukusebeshya* fishermen set the nets and wait for several hours (3–4 hours) sitting beside the nets. Nets are set in the evening (4:00–8:00 P.M.) or early morning (1:00–5:00 A.M.), and people call these fishings *ukusebeshya icungulo* (evening), *ukusebeshya kumaca* (early morning). The author already described the principle of this method in the previous paper (ibid., pp. 63–67). In the catch by *ukusebeshya icungulo* fishing recorded in the study period in 1983, the majority of the catch is composed of the two species, *Marcusenius macrolepidotus* (*mintesa*) and *Tilapia sparmanii* (*matuku*) (Tab. 7). The weight of *mintesa* caught occupies 47.4% of the total weight of the catch in this

Table 6. Catch by *Malalikishya* fishing.

(a), (b): measured in 1983. (c): measured in 1985.

Species	Mesh size (a) 1.5 ins.< kg (*pi*)	(b) 1.5 ins. kg (*pi*)	(c) 1.5 ins. kg (*pi*)
Mormyrus longirostris Boulenger	0.9 (0.012)		
Mormyrops deliciosus (Leach)	0.4 (0.005)	0	
Marcusenius monteirii (Gunther)	0.7 (0.009)	0.5 (0.001)	0.7 (0.004)
M. macrolepidotus (Peters)	10.3 (0.135)	252.3 (0.467)	56.0 (0.349)
Petrocephalus simus Sauvage	0.1 (0.001)	0.3 (0.001)	0.1 (0.001)
P. catostoma (Peters)	0.4 (0.005)	14.6 (0.027)	22.0 (0.137)
Hydrocyon vittatus Castelnau	2.0 (0.026)	0.1 (0)	0.2 (0.001)
Alestes grandisquamis Boulenger			
A. macropthalmus Gunther		0.3 (0.001)	0.9 (0.006)
A. imberi Peters	0.2 (0.003)	0.1 (0)	
Distichodus maculatus Boulenger		0.4 (0.001)	
Barbus banguelensis Boulenger	0	0.5 (0.001)	0.4 (0.002)
Labeo altivelis Peters			
Schilbe mystus (Linneaus)	0.5 (0.007)	3.1 (0.006)	0.3 (0.002)
Clarias gariepinus Peters)	7.4 (0.097)	26.1 (0.048)	6.7 (0.042)
C. ngamensis Castelnau)			
C. obscurus Poll		1.9 (0.004)	
C. theodorae Weber		10.6 (0.020)	0.4 (0.002)
C. buthpogon Sauvage	0.2 (0.003)	3.8 (0.007)	3.2 (0.020)
Heterobranchus longifilis Valanciennes			
Synodontis ornatipinnis Boulenger			
S. nigromaculatus Boulenger	0.2 (0.003)	2.7 (0.005)	4.3 (0.027)
Chrysichthys mabusi Boulenger			
Auchenoglanis occidentalis C. & V.	1.3 (0.017)	0.8 (0.001)	0.5 (0.003)
Sarotherodon macrochir Boulenger	4.8 (0.063)	1.6 (0.003)	
Tilapia rendalli Domeril	7.3 (0.096)	2.0 (0.004)	0.1 (0.001)
T. sparmanii Smith	16.5 (0.217)	182.5 (0.338)	44.7 (0.279)
Serranochromis angusticeps (Boulenger)	10.1 (0.133)	2.9 (0.005)	8.8 (0.055)
S. robustus (Gunther)		0.8 (0.001)	
S. thumbergi (Castelnau)	2.5 (0.033)	0.8 (0.001)	3.9 (0.024)
Haplochromis mellandi (Boulenger)	8.2 (0.108)	29.7 (0.055)	7.1 (0.044)
Tylochromis bangwelensis Regan	2.1 (0.028)	1.3 (0.002)	0.1 (0.001)
Ctenopoma multispinis Peters		0	0
total catch in kg	76.1 (1.000)	539.7 (1.000)	160.4 (1.000)
Mormyridae fish	12.8 (0.168)	267.7 (0.496)	78.8 (0.491)
Species diversity	8.33	2.96	4.52
number of nets	43	214	56
catch per net in kg	1.77	2.52	2.86

Table 7. Catch by *Ukusebeshya* fishing.

Species	*icungulo* (1983) kg (*pi*)	*kumaca* (1983) kg (*pi*)	*icungulo*, *kumaca* (1985) kg (*pi*)
Mormyrus longirostris Boulenger	0.6 (0.001)	0.2 (0)	
Mormyrops deliciosus (Leach)	3.0 (0.003)	3.8 (0.004)	
Marcusenius monteirii (Gunther)	40.4 (0.035)	17.9 (0.021)	
M. macrolepidotus (Peters)	550.4 (0.474)	580.8 (0.682)	25.1 (0.954)
Petrocephalus simus Sauvage	5.7 (0.005)	5.6 (0.007)	0 (0)
P. catostoma (Peters)	75.0 (0.065)	64.8 (0.076)	
Hydrocyon vittatus Castelnau	2.5 (0.002)	0.6 (0.001)	
Alestes grandisquamis Boulenger	0.1 (0)	0.1 (0)	
A. macropthalmus Gunther	1.3 (0.001)	1.2 (0.001)	
A. imberi Peters	3.7 (0.003)	2.1 (0.002)	
Distichodus maculatus Boulenger	1.1 (0.001)	1.0 (0.001)	
Barbus banguelensis Boulenger	0.5 (0)	1.1 (0.001)	
Labeo altivelis Peters			
Schilbe mystus (Linneaus)	11.6 (0.010)	18.6 (0.022)	
Clarias gariepinus Peters)	1.1 (0.001)	1.0 (0.001)	
C. ngamensis Castelnau)			
C. obscurus Poll	0.6 (0.001)	0.1 (0)	
C. theodorae Weber			
C. buthpogon Sauvage	0.4 (0)	0.2 (0)	0.1 (0.004)
Heterobranchus longifilis Valanciennes			
Synodontis ornatipinnis Boulenger	0 (0)		
S. nigromaculatus Boulenger	2.7 (0.002)	7.8 (0.009)	0.1 (0.004)
Chrysichthys mabusi Boulenger	0.2 (0)	0.4 (0)	
Auchenoglanis occidentalis C. & V.	1.2 (0.001)	0.5 (0.001)	
Sarotherodon macrochir Boulenger	7.0 (0.006)	1.6 (0.002)	
Tilapia rendalli Domeril	4.0 (0.003)	0.9 (0.001)	
T. sparmanii Smith	400.9 (0.345)	127.4 (0.150)	0.8 (0.030)
Serranochromis angusticeps (Boulenger)	7.1 (0.006)	2.7 (0.003)	0.1 (0.004)
S. robustus (Gunther)	1.0 (0.001)	0.4 (0)	
S. thumbergi (Castelnau)	3.0 (0.003)	0.4 (0)	0.1 (0.004)
Haplochromis mellandi (Boulenger)	26.9 (0.023)	7.6 (0.009)	
Tylochromis bangwelensis Regan	9.0 (0.008)	2.1 (0.002)	
Ctenopoma multispinis Peters	0.1 (0)	0.1 (0)	0 (0)
total catch in kg	1,161.1 (1.000)	851.0 (1.000)	26.3 (1.000)
Mormyridae fish	675.1 (0.581)	673.1 (0.791)	25.1 (0.954)
Cichlidae fish	458.9 (0.395)	143.1 (0.168)	
Species diversity	2.86	2.02	1.10
number of nets	577	375	22
catch per net in kg	2.01	2.26	1.20

method, and that of *matuku* occupies 34.5%. The weight of Mormyridae and Cichlidae fish occupies 97.6%. The catch by *ukusebeshya kumaca* fishing also shows a similar trend, as these two species, *mintesa* and *matuku* hold a majority. However, in the number of heads caught by this fishing, that of *mintesa* is more than four times as much as that of *matuku*. The catch of both families, Mormyridae and Cichlidae, occupies 95.9% of the total weight of the catch. The catch recorded in the study camp in 1985, where the location is different from that in 1983, also shows that the weight of *mintesa* occupies 95.4% of the total catch by both fishings, *icungulo* and *kumaca*, and that of Mormyridae fish is the same (Tab. 7). Simpson's species diversity index is 1.10, which means that the majority of catch are composed of Mormyridae fishes especially *Marcusenius macrolepidotus* (*mintesa*).

Fishermen themselves desire to catch *mintesa* fish, so they carry on *ukusebeshya* fishing actively in spite of the troubles at night caused by mosquitoes or so. In Zambia, the association of fishermen in each fishery decides a fixed price of fish in each area, which is observed by the people. In Bangweulu area, fishermen have an office of the association at a relay village, Cinsanka, which is called Fishermen's Association of Zambia, Cooperative Union at Cinsanka. Fishermen in the area sell their dried fish to the traders 3.5 Zambian Kwacha per kg (1 US doller equals to about 6 Zambian Kwacha in 1985) at their fishing camp regardless of the fish species. The author recorded fish prices at the markets, in Samfya, Mansa, the capital town of the Luapula Province about 100 km west of Samfya, and Kitwe, a large city in the Copperbelt Province, where the fish caught from the Bangweulu Swamps are circulated and consumed by the people (Tab. 8). Although fishermen sell their catch to the traders at a fixed price regardless of the fish species, prices vary with the species in the markets. For example, the price of *mintesa* goes up markedly. In Kitwe, *mintesa* are sold twelve times as much as in the swamps. Traders who come into the swamps usually prefer *mintesa* and other Mormyridae fish to other kinds of fish, and this makes the *ukusebeshya* fishing very popular toghther with the fact that *mintesa* are also their own preference. Many *nsanga* perform both types of *ukusebeshya* (*icungulo* and *kumaca*) during the same night.

The weight of catch per net is confined within 3 kg (Tab. 6, 7), for the length of *mintesa* is less than 20 cm, and the weight is less than 200 grams each. When a fisherman or a unit is to accumulate his catch for commercial use, a number of nets are required for him. All production units which adopt this method in the study camp set more than 10 nets per day.

Some fishermen attempt to carry on *ukusebeshya* fishing to catch fish species other than *mintesa*. As described above, people usually use a net of 1.5 ins. mesh size in this fishing, so that the majority of the catch is composed of the two species, *Marcusenius macrolepidotus* and *Tilapia sparmanii*. However, the author confirmed that there is a different type of *ukusebeshya* fishing in which nets of 0.5 ins. (1.27 cm) mesh size are used, and he measured the contents of the catch (Tab. 9). It is called *ukusebeshya cise*, and it is intended to catch *Petrocephalus simus* (*cise*). The total length of this species is usually below 10 cm. Tab. 9 shows that the catch by this fishing is composed of two species, *cise* and *mintesa*. The catch of both species occupies 77.3% of the total heads and 68.1% of the total weight. Fishermen cannot catch a lot of *cise* by a net of 1.5 ins. mesh size because this species is smaller than *mintesa* (Tab. 6, 7). So they use a net of smaller mesh size. The weight of the catch by this fishing is 4.99 kg per net (Tab. 9), and the efficiency is higher than that of

Table 8. Fish (dried) price in the Markets (November 1985).

Species	Vernacular name	Swamp	Samfya	Mensa	Kitwe
Tilapia sparmanii	*matuku*	3.5	5.56	7.5	13.33
Marcusenius macrolepidotus	*mintesa*	3.5	10.0	15.0	42.86
Serranochromis angusticeps	*polwe*	3.5	4.88	12.0	13.64
Tilapia rendalli	*mpende*	3.5	9.5	13.64	–
Sarotherodon macrochir	*nkamba*				
Clarias gariepinus	*muta*	3.5	–	12.0	8.33
C. ngamensis	"				
					(K. / kg)

– : unconfirmed, K.: Zambian Kwacha.

malalikishya or *ukusebeshya* fishing in which a net of 1.5 ins. mesh size is used. It must be noticed that the catch by this fishing is not sold exclusively. Only a small number of fishermen possess the net of 0.5 ins. mesh size, and the length is less than 50 yards. Most of them go for *icungulo* fishing, which means that this kind of fishing is used for self-consumption of the unit. Although the demand for *cise* fish in the market is not high and the traders do not like to purchase it, it is a favourite food to the fishermen's taste. Accordingly, they use the net of smaller mesh size to catch *cise* with this effective method of fishing.

B3. driving fish—*mukombo*—

In the previous paper (ibid., pp. 72–75), the author analysed the daily fishing ground of *mukombo* fishing and indicated that fishermen prefer the fishing ground near to their fishing camp. He also stated that any activities of reciprocity or egalitarianism such as the exchange or distribution of catch and changing the site of net cannot be seen among the group fishermen. However, the fishing ground in a particular area can be utilized in rotation by groups of *mukombo* fishermen.

As indicated in Tab. 10, the majority of fish caught by this method is composed of Cichlidae fish. According to the fish catch recorded in the study camp of 1983, three species of Cichlidae, such as *Sarotherodon macrochir* (*nkamba*), *Tilapia rendalli* (*mpende*) and *Tylochromis bangwelensis* (*nsangula*) occupy 87.9% of the total weight of catch, and *mpende* alone reaches 58% of the total weight. The fish catch measured in the study camp in 1985 also shows that all of the fish caught by this method are composed of Cichlidae fish, especially *mpende*, which occupies 72.4% of the total weight of the catch. According to Ichikawa (ibid., p. 36), the other species of Cichlidae, such as *Serranochromis angusticeps* (*polwe*) and *S. thumbergi* (*ntasa*) occupy a certain extent, which explains that the difference of constituent species of fish is reflected in the two areas. Both records of the catch meet the *mukombo* fishermen's expectations. It can be said that Cichlidae fish like *Tilapia rendalli* whose length is 20–40 cm is the main object of a catch by this fishing.

Although the fishing methods, A4 and A5, mentioned below are not classified as commercial fishing methods (Tab. 4), it is worth indicating the contents of catch by these methods, because it is a good reflection of the fishermen's expectations. Moreover, the author would like to find a clue to describe the common fea-

Table 9. Catch by *Ukusebeshya cise* fishing.

Species	kg (*pi*)		Head
Mormyrus longirostris Boulenger			
Mormyrops deliciosus (Leach)			
Marcusenius monteirii (Gunther)			
M. macrolepidotus (Peters)	14.5	(0.264)	1,114
Petrocephalus simus Sauvage	22.9	(0.417)	2,936
P. catostoma (Peters)	6.7	(0.122)	630
Hydrocyon vittatus Castelnau			
Alestes grandisquamis Boulenger	0.1	(0.002)	5
A. macropthalmus Gunther			
A. imberi Peters			
Distichodus maculatus Boulenger	0	(0)	2
Barbus banguelensis Boulenger	5.1	(0.093)	295
Lebeo altivelis Peters			
Schilbe mystus (Linneaus)	2.4	(0.044)	118
Clarias gariepinus Peters			
C. ngamensis Castelnau			
C. obscurus Poll			
C. theodorae Weber			
C. buthpogon Sauvage	0.1	(0.002)	1
Heterobranchus longifilis Valanciennes			
Synodontis ornatipinnis Boulenger			
S. nigromaculatus Boulenger	0.1	(0.002)	3
Chrysichthys mabusi Boulenger			
Auchenoglanis occidentalis C. & V.			
Sarotherodon macrochir Boulenger			
Tilapia rendalli Domeril	0	(0)	1
T. sparmanii Smith	2.1	(0.038)	108
Serranochromis angusticeps (Boulenger)	0	(0)	1
S. robustus (Gunther)			
S. thumbergi (Castelnau)			
Haplochromis mellandi (Boulenger)	0.9	(0.016)	26
Tylochromis bangwelensis Regan			
Ctenopoma multispinis Peters			
total catch in kg	54.9	(1.000)	
Mormyridae fish	44.1	(0.803)	
Species diversity	3.69		
number of nets	11		
catch per net in kg	4.99		

Table 10. Catch by *Mukombo* fishing.

Species	1984 kg (*pi*)		Head	1985 kg (*pi*)		Head
Mormyrus longirostris Boulenger						
Mormyrops deliciosus (Leach)						
Marcusenius monteirii (Gunther)	0	(0)	3			
M. macrolepidotus (Peters)	0.4	(0)	4			
Petrocephalus simus Sauvage						
P. catostoma (Peters)						
Hydrocyon vittatus Castelnau	3.2	(0.001)	17			
Alestes grandisquamis Boulenger	0.1	(0)	2			
A. macropthalmus Gunther	0	(0)	1			
A. imberi Peters	0	(0)	3			
Distichodus maculatus Boulenger						
Barbus banguelensis Boulenger						
Lebeo altivelis Peters						
Schilbe mystus (Linneaus)	0.5	(0)	6			
Clarias gariepinus Peters)	39.7	(0.017)	89			
C. ngamensis Castelnau)						
C. obscurus Poll						
C. theodorae Weber						
C. buthpogon Sauvage	0.8	(0)	1			
Heterobranchus longifilis Valanciennes						
Synodontis ornatipinnis Boulenger						
S. nigromaculatus Boulenger	0	(0)	1			
Chrysichthys mabusi Boulenger						
Auchenoglanis occidentalis C. & V.	3.7	(0.002)	8			
Sarotherodon macrochir Boulenger	424.5	(0.182)	3,508	7.9	(0.114)	41
Tilapia rendalli Domeril	1,352.1	(0.581)	9,989	50.3	(0.724)	342
T. sparmanii Smith	13.1	(0.006)	294			
Serranochromis angusticeps (Boulenger)	118.2	(0.051)	695	3.1	(0.045)	16
S. robustus (Gunther)	17.0	(0.007)	55	0.2	(0.003)	1
S. thumbergi (Castelnau)	59.2	(0.025)	307	6.5	(0.094)	36
Haplochromis mellandi (Boulenger)	25.5	(0.011)	246	0.4	(0.006)	3
Tylochromis bangwelensis Regan	270.5	(0.116)	3,077	1.1	(0.016)	6
Ctenopoma multispinis Peters						
total catch in kg	2,328.5	(1.000)		69.5	(1.000)	
Species diversity	2.57			1.82		
fishing days	197			10		

tures of the swamp fishing methods.

A4. driving small fish (to basket or mosquito net)—*ukusaya*—

This is a fishing method using a basket (*ulwanga*) or a mosquito net (*candaluwa*), and is normally done by several women and children in shallow water around a fishing camp. In the study camp, it was observed that small frys of *Alestes macropthalmus* (*tala*), *Barbus banguelensis* and *Haplochromis mellandi* (*mbilia*) were captured by this method. It is frequently used for self-consumption of the fishermen in the period from October to November, when these frys can be seen easily in the channel in front of the camp. The *ulwanga* or *candaluwa* is used in a scoop fashon by one or two women, being pushed in front of the women with the open mouth forward. Other persons drive the frys into the basket from the upper side. Tab. 11 shows the contents of the catch by this method which was measured in the study period of 1985. The intention of three women was to catch *Barbus banguelensis* into *ulwangas*. According to the table, the species occupies 93% of the total heads and 64.5% of the weight. It can be said that the target fish is captured effectively in spite of the fact that it is done occasionally and on a small scale for self-consumption of the people.

A5. weir fishing—*ubwamba*—

The basket called *umono* (pl. *imyono*) and the weir or the fence (*ubwamba*) are both used in this type of fishing. *Ubwamba* is made of *matete* reed (*Phragmites mauritianus*) in the channel, and *umono* is set between the *ubwamba*. Fishes moving upstream enter into the *umono* with its mouth facing upstream, for they tend to be swept back by the current. Brelsford (ibid., p. 60) states that *ubwamba* is made of mud on the edge of a flood plain when the water level decreases. Tab. 11 shows that the majority of the catch by this method which was measured in the study camp in Oct. 1985 is composed of *Marcusenius macrolepidotus* (*mintesa*), which is 97% of the heads and about 91% of the weight. It is said that *Schilbe mystus* (*lupata*) are sometimes caught much. There are some fishermen who adopt and carry on this method as commercial fishing.

Summary

Several fishing methods in the swamps and the features of the catch by each method are described above. The common features of the fishermen in the swamps can be pointed out here. The fishermen select a suitable method in order to catch a particular kind of fish regardless of the disposal of the catch, self-consumption or commercial use. For example, *ulwanga* fishing clearly aims to catch *Barbus banguelensis*, and the majority of catch are composed of this species (Tab. 11). As for the method which aims to catch a particular fish, we can report the methods *ukusebeshya cise* which use the net of smaller mesh size to catch *Petrocephalus simus* (*cise*) (Tab. 9), *ubwanba* which mainly catch *mintesa* (Tab. 11) and *ukusakila lupata* which is reported by Ichikawa (ibid., p. 33) as a driving method to catch *Schilbe mystus* (*lupata*). Each fishing unit which aims to sell the catch usually adopt a particular method and mesh size of net to collect the target fish as much as possible. Fishermen can catch a large quantity of Mormyridae fish such as *Marcusenius macrolepidotus* by *ukusebeshya* fishing in which fishermen set the nets of 1.5 ins. mesh size near the floating islands for several hours at night. On the other hand, *mukombo* fishermen can collect the larger Cichlidae fish such as *Tilapia rendalli* in the open shallow area by net of more than 2 ins. mesh size. Besides this, it must be empha-

Table 11. Catch by A4(*ukusaya*) and A5(*ubwamba*) fishing.

Oct. 1985

Species	*ulwanga* fishing		*ubwamba* fishing	
	kg	Head	kg	Head
Mormyrus longirostris Boulenger				
Mormyrops deliciosus (Leach)				
Marcusenius monteiri (Gunther)				
M. macrolepidotus (Peters)			15.7	389
Petrocephalus simus Sauvage				
P. catostoma (Peters)				
Hydrocyon vittatus Castelnau				
Alestes grandisquamis Boulenger		1		
A. macropthalmus Gunther				
A. imberi Peters				
Distichodus maculatus Boulenger				
Barbus banguelensis Boulenger	4.55	1,049		1
Lebeo altivelis Peters				
Schilbe mystus (Linneaus)				2
Clarias gariepinus Peters				
C. ngamensis Castelnau				
C. obscurus Poll				
C. theodorae Weber				3
C. buthpogon Sauvage				
Heterobranchus longifilis Valanciennes				
Synodontis ornatipinnis Boulenger				
S. nigromaculatus Boulenger				
Chrysichthys mabusi Boulenger				
Auchenoglanis occidentalis C. & V.				
Sarotherodon macrochir Boulenger				
Tilapia rendalli Domeril		2		
T. sparmanii Smith		60		2
Serranochromis angusticeps (Boulenger)		7		2
S. robustus (Gunther)				
S. thumbergi (Castelnau)		1		1
Haplochromis mellandi (Boulenger)		7		
Tylochromis bangwelensis Regan				1
Ctenopoma multispinis Peters				
total catch in kg	7.05		17.3	
number of baskets	3		6	

sized that the contents of the catch by the same method change completely according to the fishing hours used. As pointed out in the previous paper (ibid., pp. 67–70), the catch by *mukwao* fishing (seine net) are composed of Cichlidae fish in day fishing, and Mormyridae fish in night fishing. Ichikawa (ibid., p. 35) insists that *mukwao* fishing is not very selective as a whole, as the Simpson's index of diversity (9.84) is not small. However, we cannot fail to notice that the different hours for fishing are used properly by the fishermen for the purpose of collecting a particular group of fish. For example, the *mukwao* fishermen in the study camp went fishing every night to collect *mintesa* instead of going for day fishing (Imai, ibid., p. 77). As shown in Tab. 11 of the previous paper (ibid., p. 78), the total amount of catch by night *mukwao* is 1,851.3 kg in 52 fishing days, so that the amount of catch by night fishing is 35.6 kg per day. In 1983, the author measured the catch by day *mukwao* fishing twice. The amount of them were 10.0 kg and 50.1 kg each, which do not vary much with that by night *mukwao* (Imai, ibid.). It can be said that the fishermen adopt a fishing method not only by the amount, but also by the fish species of catch.

Lastly, the author would like to consider the reason why the contents of the catch is apt to be partial to the particular species. As described above, although fishermen sell their catch to the traders at a fixed price regardless of the fish species, the prices in the markets vary much with the species. From the point of view that fishermen want to maximize the profit from selling the catch, it cannot be found a point of advantage to collect a particular group of fish as the fishermen do. This seems to occur when the fishermen in this area are not organized strongly, so that each fishing unit has to have a business with traders individually. The degree of organization among the fishermen is a little different from fishery to fishery in Zambia. In the extensive survey carried out by the author in 1985, it was said that at Ncherenge, on the south-eastern shore of Lake Mweru, there exists a cooperative union of fishermen which collects most of the catch and transports them to the markets in the Copperbelt Province for selling. The author already pointed out the existence of the traders who go round the fishing camps in the previous paper (ibid., pp. 83–85), and divided them into two groups, one of which is the local people living around the swamps, and the other is the traders who come from the Copperbelt. Although the traders from the Copperbelt are apt to refuse to purchase fishes other than Mormyridae or larger Cichlidae fish, they have to purchase the other fish at a fixed price when the catch of these fishes decreases in the rainy season. Even in the dry season, there exist some local traders who barter some vital commodities and foods for the small fish such as *Tilapia sparmanii* (*matuku*) to sell them at the local markets. It can be thought that the less organized fishermen in the Bangweulu Swamps can receive a protection to a certain degree from the pressure of economic circulation, because the fish price is fixed at any time regardless of the species.

It can be interpreted that each fishing unit is apt to adapt itself to the demand of market consumers to sell their catch smoothly. Moreover, when the fishermen catch fish for their self-consumption, they also aim to catch a particular species and get it effectively. *Ulwanga* and *ukusebeshya cise* fishing as described above are good examples of this. Consequently, it can be said that the fishermen have a good understanding of the habit of target fishes, and know how to handle the gear to catch them according to the surrounding environment of fish.

MODES OF FISHING

In the former chapters, a description has been made of the organization of fishing formed by the fishermen whose home villages are inside and outside the swamps, the methods of fishing in the swamps and the catch by the commercial fishing methods. Several features of these methods are also pointed out. Consequently, it is indicated that each fishing unit actually catches a particular group of fish by adopting a certain fishing method. In this chapter, modes of fishing of the fishermen in this area whose number is thought to be about 7,000 (Tait, 1965, p. 70) or more, are divided into three types, and the actual condition of the swamp utilization among them is discussed in order to consider the factors which yield those types of fishing.

Fishermen in the Bangweulu Swamps, all of whom are the Bemba speaking people, form the production unit for fishing as described above, which are not organized and each unit acts to sell fish catch individually. According to the field research of the author, the activity pattern of the swamp fishermen (or production unit) can be divided into two distinct types as follows according to the dominant fishing method (Tab. 2). All the fishermen in the study camp of 1983 and 1985 were unanimous to this division.

(i) *mukombo* (driving fish) type
(ii) *malalikishya* (stationary gill net) type

The fishing period of the (i) type fishermen is from April to early November. They adopt *malalikishya* fishing in April and May, and after that period when the water level decreases, they change the method to *mukombo* fishing to catch Cichlidae fish. Most of the (i) type fishermen enter into the swamps from their home villages in the northern area of Lake Bangweulu, more than 100 km apart from the swamps, so that they have to enter into the swamps all the way from their villages by canoe. They are the people called the N'gumbo and the Mukulu (Fig. 3). On the other hand, fishermen who adopt (ii) type attempt to carry on their fishing in the swamps from April to July, and from October to January. Most of them adopt *malalikishya* or *ukusebeshya* fishing to catch the nocturnal Mormyridae fish. Their home villages are on the small islands the extent of which is about several to ten square kilometres inside the swamps, such as Kasoma, Nsalushi, Ncheta etc. (Fig. 2). Few of them attempt to fish around their villages, but they usually go to the area 10 to 20 km away from their home villages, and set their fishing camps (*pamitanda*). They are the people called the Unga (Fig. 3). The people who have their home villages around the swamps or the lake shore do not adopt a specified fishing method as a group. Some of their production units adopt *mukombo* fishing like (i) type, other units adopt the stationary gill net fishing to catch Mormyridae fish the same as (ii) type fishermen. There also are some fishermen who adopt *mukwao* or *ubwamba* fishing to get a large amount of catch. Most of them come from their villages 40–50 km away from the swamps, which lie halfway between the area of (i) type and (ii) type fishermen. The people whose home villages are on the south-eastern shore of the lake are called the Bisa, and on the south-western shore of the lake are called the Kabende (Fig. 3). They cannot be difined as (i) or (ii) type as a whole ethnic group.

Some informants of (i) type fishermen in the study camp told the author that the people of the N'gumbo and the Mukulu begin to work for cassava cultivation

around their home villages from November or December. As they do not have to work very hard before that period, most of them are able to enter into the swamps for fishing from April to early November. According to Cunnison (1959, pp. 16–18), the Luapula people hoe up the gardens in oval or semi-circular mounds and stick old cassava plants into each mound. In mounds of first-year cassava, seeds of pumpkins, maize or ground nuts are usually planted, for these will ripen towards the end of the rains, from February to May. Cassava roots are large enough in the second dry season to be pulled out as required, and cassava may be dug out during its second, third or even fourth years. Those who grow finger millet by *citemene* system are people who do not fish themselves, and there is a barter of fish against finger millet. Their number is rather small. The cultivation system of the (i) type fishermen may be similar to that of the Luapula people, despite the fact that the author has never been to the home villages of (i) type fishermen.

There are several backgrounds why (i) type fishermen adopt *mukombo* fishing, as mentioned below.

(1). Large fishes of Cichlidae spread over the swamps in the rainy season, and many of them remain there until October, so that they are easy to be caught by the fishermen. As stated in the previous paper (ibid., p. 52), fishes are confined to the channels, rivers and open lakes to avoid the stagnation of the water in the dry season. After it rains, the swamp water mixes with the floods and is replaced by river water with a high oxygen concentration, and then fishes spread out again over the swamp area (Tait, ibid., p. 69).

(2). Water level decreases in this period (Fig. 4), so that it becomes favorable for *mukombo* fishing. It cannot be done in an area where the depth of water is high.

(3). The maximum temperature rarely rises over 30°C in the period from June to September, so that it is not heavy work for fishermen to move frequently in *mukombo* fishing.

(4). It is a long way to the swamps from their home villages by small canoe, so it is not easy for them to carry a great amount of gear into the swamps at one time. Although the commercial fishing by the stationary gill net fishing needs a lot of fishing nets, *mukombo* fishing can be done by a net (*kacaala*) and a stick (*akatole*). Moreover, *kacaala* is not as heavy as other kinds of gill nets, because sinkers are not attached to *kacaala*, so that fishermen can move their nets at short intervals. However, the author has not yet considered properly the reasons why sinkers are not attached to *kacaala*. A net of stationary gill net fishing is usually set with about 50 pieces of sinkers, weight of which is about 30 grams each. Accordingly, it is about 1.5 kg heavier than *kacaala* net. As shown in Tab. 6, 7, the amount of catch per net by the stationary gill net method is about 2 kg, so that the (ii) type fishermen are apt to carry their nets to the fishing camps more than ten. There is a difference of gross weight by 15–20 kg between the fishing gears of the (i) and (ii) type fishermen.

From the points as mentioned above, it can be considered that (i) type fishermen have to adopt *malalikishya* fishing on a small scale in April and May when the water level is still high, then they are able to change to *mukombo* fishing when the water level decreases.

The (ii) type fishermen such as the inhabitants in Kasoma island, usually go to an area to make a settlement for cassava cultivation (*amalimino*) several kilometres away from the main villages, for there is not enough cultivable land

around their villages. From August to October, when the water level decreases in the swamps, they make mounds in the dried up gardens to plant cassava, sweet potato and others. They carry on agriculture with a special system of their own, despite the fact that they are living in an unsuitable area for cultivation. So they are able to go fishing in the period from April to July and October to January. Therefore, the swamp dwellers go out of their villages for several months three times a year for cultivation and fishing. There are several reasons why they adopt the stationary gill net fishing as mentioned below.

(1). *Malalikishya* fishing can be done in the period from April to July when the water level is still high.

(2). As many flocks of Mormyridae fish come to the swamps where the water level is not high from October to December, fishermen can get a great amount of fish by *ukusebeshya* fishing. According to Jackson (1961, p. 33), *Marcusenius macrolepidotus* (*mintesa*) is known to have an annual migration for spawning purposes (Bell-Cross, 1960) and moves about three or four months after the rains, and is then much caught in weirs (Brelsford, ibid., p. 61). Jackson also supposes that this migration is to escape deoxygenated water as the dry season advances.

(3). It is easier for the fishermen to act at night for *ukusebeshya* fishing, from October to December than from June to July when it is colder.

(4). In December and January, it is difficult for the fishermen to continue *ukusebeshya* fishing, because it rains frequently. However, they can transfer the fishing method from *ukusebeshya* to *malalikishya*, as described in the previous paper (ibid., pp. 77–81).

(5). As the distance from their villages to the fishing grounds is rather short, the fishermen can carry their fishing gear to the fishing camps easily.

From the points mentioned above, the fishing periods of (ii) type fishermen are from April to July and from October to January, which is a little different from that of (i) type, when they adopt *malalikishya* with *ukusebeshya* fishing.

It is possible for the people whose home villages are near the town on the lake shore such as Samfya, Chaba, to adopt a form of fishing with a wide range. For they can get and use essential commodities, such as foods, fuel and manufactured goods more easily than the other types of fishermen. They are able to adopt not only *mukombo* or *malalikishya*, but also *ubwamba* or *mukwao* fishing for commercial use. Many of them cultivate maize or cassava around the home villages. However, they do not carry on slash-and-burn agriculture like *citemene* on a large scale. Their home villages are not so far from the swamps, and their fishing period is not restricted by cultivation. These make it possible for them to go back and forth between the villages and the swamps.

Fishermen of these ethnic groups utilize the swamps for fishing with respect to adopting a particular fishing method, which is restricted to the patterns of subsistence activity such as cultivation and the distance from their home villages. The contents of each catch by these methods are different from each other, for suitable season and grounds for fishing vary with the methods. It can be said that no clash occurs among the fishermen, concerning the same resources of the swamps. As pointed out in the previous paper (ibid., p. 87), their swamp use can be interpreted as a segregation influence among the swamp fishermen. As described above, most of the lands above water level in the dry season are flooded after the rains, so that fishermen cannot stay in the swamps all the year round. That also

holds true of even the Unga who are the swamp islanders.

As explained in this chapter, when the fishermen adopt suitable periods and methods for fishing, they can get the target fish effectively, for many kinds of fish migrate seasonally in shoals (Jackson, ibid., Tait, ibid.). The swamp fishermen schedule the two kinds of activities, agriculture and fishing, into their annual life cycle.

CONCLUSION

As described in a previous chapter, the length of approach to the swamps from the home villages of the fishermen and their system of cultivation are the two main factors in the differences of mode of fishing among the ethnic groups.

Although the Unga fishermen have only a short approach to the swamps and can carry their gear into the swamps easily, the period of fishing is restricted by their cultivation for cassava in the swamp area. Nevertheless a lot of Mormyridae fish can be caught by *ukusebeshya* fishing in the period from October to December, for they are more active in this period. On the other hand, the N'gumbo and the Mukulu fishermen, who have a longer approach to the swamps, cannot carry their nets sufficiently into the swamps for commercial fishing. Most of them can be engaged in fishing from June to September, when they do not have to work hard around their villages. They usually adopt to carry on *mukombo* fishing to catch Cichlidae fish which can be caught in shallow waters.

People living around the swamps are attracted to swamp fishing and have carried it on for many years, despite the fact that the swamps are far from their home villages and uncomfortable places for living. In the final chapter, the motives of their swamp fishing is discussed and is positioned so as to see the whole life of the fishermen. According to former interpretations, a swamp area is regarded as a marginal habitat in which people cannot cultivate any crops but make their living with a primitive way of fishing. It is also inferred that they have a symbiotic relationship with other cultivators surrounding them and are being looked down upon (Kakeya & Ichikawa, 1983, p. 44). Ankei (1984, pp. 337–421, 1986, pp. 249–277) already reported in full detail the symbiotic relationships through barter trade among cultivators and fishermen of the Songola people who are living along the Zaire River. He states that there are some symbiotic relationships through barter trade of foods among the people who make their living by different kinds of subsistence to each other. However, it proved to be a fact that the fishermen in the Bangweulu Swamps engage themselves in fishing while making their living mainly by agriculture.

As it is difficult to introduce larger vessels into the swamp area for transportation because of shallow channels, the fishermen cannot put enough money in to their canoes and the other fishing gear. A fishing industry which pursues a good profit from city markets has not yet been developed on the Bangweulu Swamps. However, the fishermen can get more money than the other farmers in Zambia by means of selling their fish catch. It is clear that the fishermen act with intensity, as described in this paper, by looking forward to getting much profit. This would be a large factor in keeping them from forming symbiotic relationships with other groups. And it is natural for them to be attracted by the fish meat from the

swamps, because they hardly ever go hunting around their villages, and keep only a small number of livestock other than dogs and chicken. A fisherman is apt to go fishing to the swamps with his wife and children. It can be thought of as an expression of their earnest desire of getting fish meat for food. In other words, the fishermen in the Bangweulu Swamps have a different character from an emigrant man who works in the cities or mines. Although most fishing is done by men, the actual life in the swamps is carried on by whole families altogether. Both activities for subsistence, cultivation and fishing, are an essential part of the life of the people around the Bangweulu Swamps.

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